GEOPHYSICAL MODEL OF CARBONATE-HOSTED Au-Ag

COX AND SINGER MODEL No. 26a

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A. Geologic Setting

- Regionally adjacent to or along high-angle normal fault zones related to continental margin rifting, or regional thrust faults or bedding.
- Selective hydrothermal replacement of carbonaceous limestones or dolomite where these are intruded by igneous rocks.
- Very fine grain native gold and/or silver, pyrite and arsenic sulfide disseminated in host rocks and associated silica replacement.

B. Geologic Environment Definition

Remote sensing data can define major lineaments and tectonic structural zones and their intersection with major fault systems (Rowan and Wetlaufer, 1981). Remotely sensed data can define major lithologic boundaries and areas of alteration (Kruse and others, 1988). Aeromagnetic and gravity methods have been used to delineate the margins of intrusions in the near subsurface and determine major faults beneath sedimentary cover (Grauch, 1988, Grauch and Bankey, 1991). Radioelement data have possibilities for defining zones of hydrothermal alteration associated with faulting (Pitkin, 1991). Airborne electromagnetic resistivity data have been used to map lithology and detect alteration in addition to delineating structure at the surface and under shallow cover (Taylor, 1990; Pierce and Hoover, 1991; Hoover and others, 1991; and Wojniak and Hoover, 1991).

C. Deposit Definition

High angle fault zones and shear zones can be mapped by a variety of electromagnetic methods as conductive anomalies within sediments or crystalline rocks (Hoekstra and others, 1989; Hoover and others, 1984; Heran and Smith, 1984; Heran and McCafferty, 1986). Detailed magnetic and gravity surveys can be employed to delineate pluton margins, map major fault zones, lithologic boundaries and determine depth of alluvial cover (Grauch, 1988). Electrial resistivity methods are able to map hydrothermal alteration and faulting as a resistivity low and silicification caps as a high (Hallof, 1989; Corbett, 1990; and Hoekstra and others, 1989). Seismic methods have been used to delineate high angle faults, lithologic contacts and hydrothermal alteration (Cooksley and Kendrick, 1990). Gold bearing structures containing clay or carbonaceous (graphite) material can be mapped using the induced polarization method. Radiometric surveys have possibilities for mapping alteration along faults (Porter, 1984).

D. **Size and Shape of**	**Shape**	**Average Size/Range**
Deposit	Tabular to highly irregular	3.9,0.4-20x10^6 m^3
Alteration Haloe/s	Variable, irregular	?
Cap	Irregular blanket	?

E. **Physical Properties** (units)	**Deposit**	**Alteration**	**Cap**	**Host**
Description	Hydrothermal replacement of calcareous rock		Siliceous replacement	calcareous rocks
1. density (gm/cc)	2.6		?	2.65-1.9-2.91
2. porosity	?	?	?	
3. susceptibility (10^{-6}cgs)	0.0-?		low	20-0-280[1]
4. remanence	low		low	
5. resistivity (ohm-m)	20,10-50		variable	1500-350-6000 [1]
6. chargeability (mv-sec/v)	30,20-40[1]		?	5.2-20[1]
7. seismic vel. (km/sec)	2.5[2]	-	?	4.3-6[2]
8. radioelements				
K%	variable up to 4.5		?	0.27
U-ppm	variable up to 10	-	?	2.2,0.1-9.0
Th-ppm	variable up to 16	-	?	1.7,0.1-7
9. Other (specific)				

F. Remote Sensing Characteristics

Visible and Near IR - Regionally, landsat images have been used to delineate lineaments and major structural zones in Nevada (Rowan and Wetlaufer, 1981). Distinctive signatures can be detected from hydrothermal alteration products exposed at the surface (ie., illite, kaolinite, montmorillonite, jarosite and alunite).

Thermal IR - Emissivity-ratio images prepared from data acquired by the Thermal Infrared Mapping System (TIMS) have been used to detect and map previously unrecognized silicified carbonate host rocks at the Carlin deposit, Nevada (Watson and others, 1990).

G. Comments

Intense exploration for this deposit type in the 80's has generated a variety of geophysical applications many of which are helpful in areas of cover. Regional exploration can be greatly aided by remote sensing and airborne EM. Ground EM profiling is the best bet for locating faults. Electrical or EM techniques can define areas of alteration.

H. References

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GETCHELL MINE, NEVADA
RESISTIVITY AND RADIOELEMENT DATA

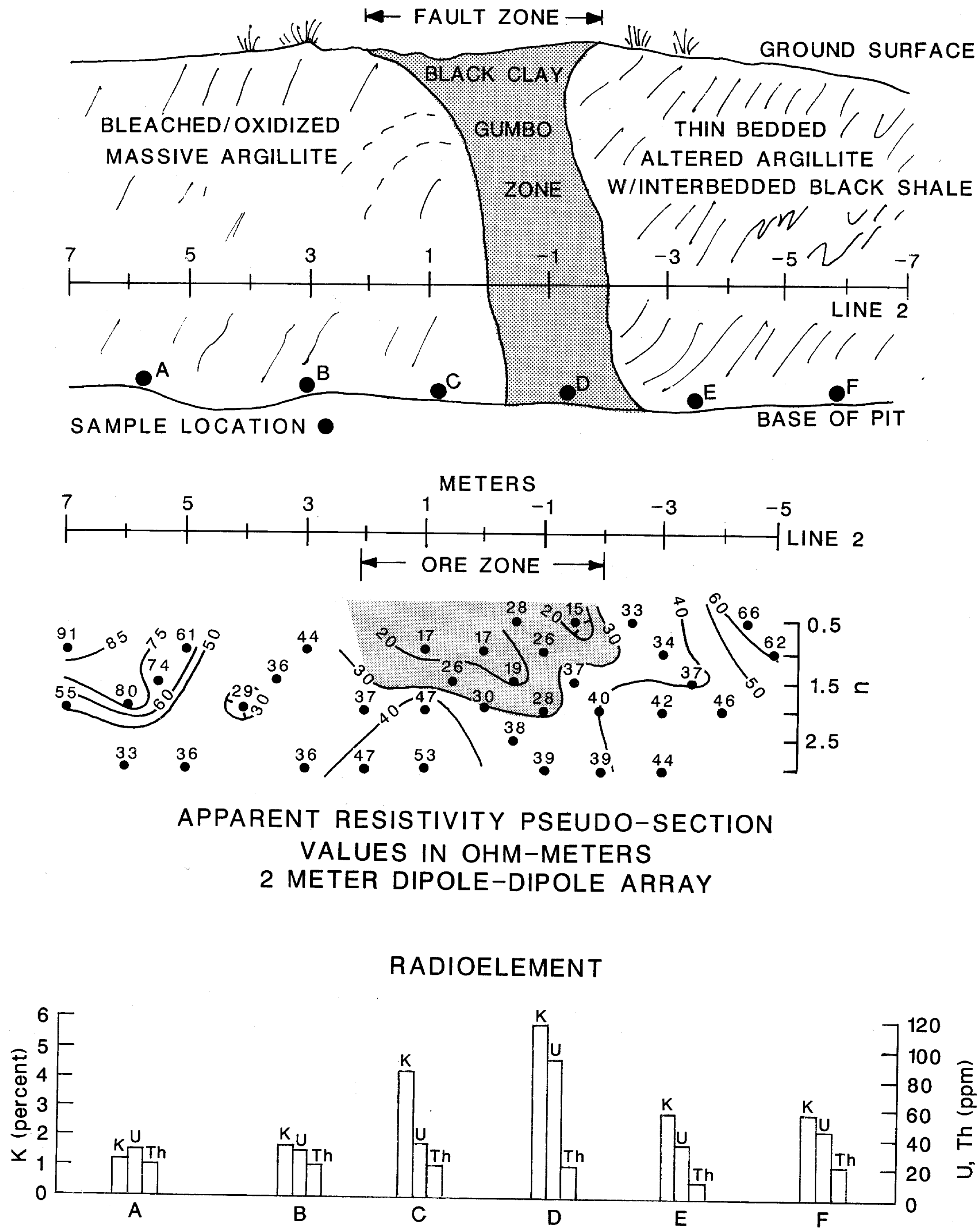

Figure 1. Apparent resistivity and radioelement data obtained in the South Pit at the Getchell Mine, Humbolt County, Nevada. Short-dipole in-situ electrical measurements taken across a mineralized structure, show low resistivities correlated with the ore zone. Radioelement data show significant increases in K and U in the ore zone (Heran and Smith, 1984).

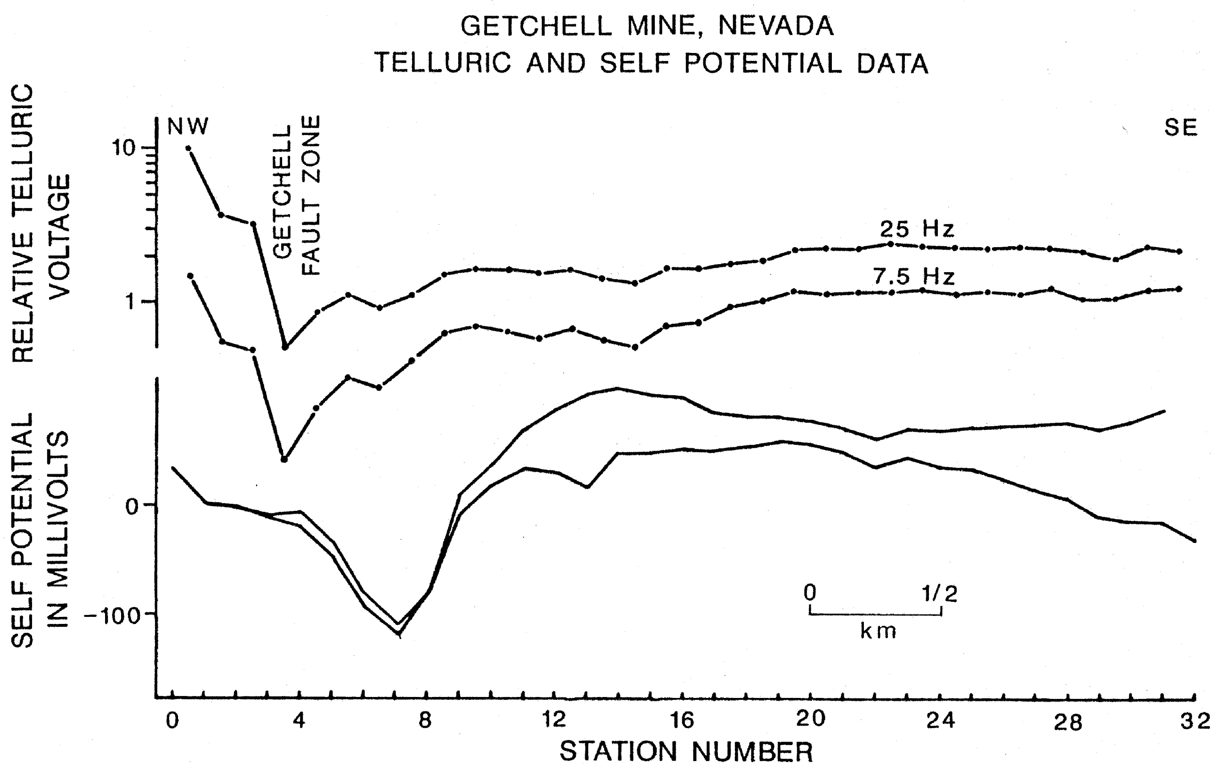

Figure 2. Telluric and self potential data across the northern end of First Miss Gold's Summer Camp deposit prior to mining. The Getchell fault zone shows as a pronounced low in relative telluric voltage, indicating that the fault zone at 25 and 7.5 Hz has much lower resistivity than the surrounding rocks. A broad self potential low is observed east of the main fault zone which is inferred to be related to graphitic material along a parallel fault (from Hoover and others, 1986).